

KROHNITTELLIDAE AND BATHYBELIDAE,
NEW FAMILIES IN THE PHYLUM CHAETOGNATHA;
THE REJECTION OF THE FAMILY
TOKIOKAISPADELLIDAE AND THE GENERA
TOKIOKAISPADELLA, *ZAHONYA*, AND
ABERROSPADELLA

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Abstract.—New monogeneric families are proposed for the genera *Krohnittella* and *Bathybelos* (Krohnittellidae and Bathybelidae). The family Tokiokaispadellidae is considered invalid because the type species is a misidentified *Pterosagitta draco*. Morphologic changes in poorly preserved chaetognaths are described, and the genera *Zahonya* and *Aberrospadella*, based on poorly preserved specimens, are considered invalid.

After compiling a comprehensive list of approximately 100 species in 22 genera currently included in the phylum Chaetognatha, it became clear to me that the genus *Krohnittella* has not been assigned to any extant family and the genus *Bathybelos* is so exceptional that it cannot be included in any extant family. Therefore, to correct these inconsistencies I propose the following two new families.

Krohnittellidae, new family

Diagnosis.—The family lacks both anterior and posterior teeth. A single pair of lateral fins, completely rayed, partly on the trunk and partly on the tail do not reach the ventral ganglion. No ventral transverse musculature.

Discussion.—The family is monogeneric containing the single genus, *Krohnittella* Germain & Joubin, 1912. The authors based their new genus on two specimens taken in a 4000 m net tow that possibly struck bottom in the eastern North Atlantic. Because more than 60 years passed before the genus was reported again, considerable doubt existed about its validity. Tokioka in his 1965 revision retained it as valid, but did not

assign it to any known family. Bieri (1974) rediscovered the genus in the eastern North Pacific where a single, nearly mature specimen in good condition was caught with an opening-closing sled trawl at 2000 m in the San Clemente Basin. The lack of ventral transverse musculature and teeth clearly differentiate the family from the Eukrohnitiidae and Spadellidae. Salvini-Plawen (1986), unaware of Bieri's (1974) paper, suggested that the genus may belong to *Bathyspadella*. The lack of transverse musculature in *Krohnittella* is irreconcilable with *Bathyspadella* which in any case is the junior genus. Although the names are similar, there is no confusion with the family Krohnittidae whose members have a single pair of flabelliform teeth among other distinguishing characteristics.

Bathybelidae, new family

Diagnosis.—No ventral ganglion but rather a dorsal ganglion. Two pairs of lateral fins completely lack fin rays. One paired row of teeth which are highly curved. Eyes vestigial.

Discussion.—The family is monogeneric containing the single genus, *Bathybelos*. In

her paper describing the genus, Owre (1973) (=Michel) referred to the dorsal nerve ganglion as a cerebral ganglion but in her later description (Michel 1984) she referred to it as a rectangular nerve center. I think dorsal ganglion or nerve center is more accurate than cerebral because it is posterior to the apparent location of the vestigial eyes and is more in the position of the corona ciliata. In all known chaetognaths the cerebral ganglion is well anterior to the eyes (Goto & Yoshida 1987). The second unique feature of this species is the complete lack of rays in the lateral fins. All other known chaetognaths, except the problematic *Aberrospadella* discussed below, have some rays in the lateral fins. These characters and the presence of only one paired row of teeth differentiate it from the families Sagittidae, Eukrohniidae, and Spadellidae.

Status of the Family Tokiokaispadellidae

In 1986 Salvini-Plawen erected a new family, Tokiokaispadellidae to contain *Tokiokaispadella lata* Kassatkina, 1980. The original type genus of the family is incorrectly given as *Tokiospadella*, apparently a typographical error (Salvini-Plawen 1986: 126). It is clear that the single specimen which formed the basis of Kassatkina's new genus and species is nothing more than a poorly preserved specimen of the common species *Pterosagitta draco*, ubiquitous in the tropical and semitropical oceanic waters of the world.

In Kassatkina's (1980) description of the new species, taken in a 0–14 m net tow in a lagoon north of New Guinea, the posterior fin reaches only to the transverse septum and is completely rayed as in *P. draco*. There are two paired rows of teeth as in *P. draco*. The tooth and hook formula agrees with that given by Alvares (1967) for *P. draco*. The collarette is narrow and extends from the neck to the tail fin. In perfectly preserved specimens of *P. draco*, the collarette extends onto the tail fin and is nearly as broad on

each side as the body width. But as E. L. Michael (1919) pointed out long ago, the collarette is usually eroded to varying degrees. Sometimes it is completely missing. It is very rare to find *P. draco* with a completely intact collarette and almost never are the "wings" of the collarette preserved (Bieri 1966). In Kassatkina's specimen the collarette is partly stripped away, the usual situation when relatively coarse meshed nets are used or the net is towed faster than about 25 cm per second.

The ovaries are short and immature and there is no indication of seminal vesicles. Her figure shows large gut diverticulae but Alvares (1967) stated that in *P. draco* the diverticulae are small and incipient. Kassatkina's drawing shows the corona ciliata extending well up onto the head between the eyes, but in the text states that it is entirely on the trunk. Aida (1897) and Grassi (1883) show the corona entirely on the trunk whereas Ghirardelli (1952) showed it extending onto the head. Tokioka (1940) showed the corona in three figures. In two of the figures it is on the trunk, but in the largest figure it is partly on the head.

Thus there are no characters which differentiate this species from *P. draco* except the ventral transverse musculature, the very short tail segment, and the relatively great body width. None of these characters were listed in Salvini-Plawen's extremely short diagnosis of the new family.

Tokioka (1952:312) in discussing the transverse musculature of the enigmatic genus *Zahonya*, wrote, "It is a noteworthy fact that some species with strongly developed musculature assume an appearance, when they are in a slightly contracted state, as if they were provided with a transverse musculature along the whole body." Nagasawa & Nemoto (1985) discussed the distortion of chaetognaths probably due to attack by bacteria. They documented the shortening of the body length by 50% but did not describe the appearance of pseudo-transverse musculature. My own experience convinces me that if chaetognaths are trawled for more

than half an hour, some specimens will be seriously damaged and distorted not just by physical abrasion but also by bacterial attack as discussed by Nagasawa and Nemoto, and by biochemical lysis after death. If the plankton sample is not preserved immediately upon retrieval from the sea, distorted individuals may compose from a few to all of the plankton sample. Chaetognaths that die before preservation and are left unpreserved for more than a few minutes develop contracted longitudinal muscles that have a series of interruptions that look superficially like transverse muscles as Tokioka reported. I have seen this condition in almost every species of chaetognath from samples throughout the Pacific and from the Arctic Ocean. The specimens lose their characteristic crystalline transparency and become chalky-white in reflected light or opaque-grey in transmitted light. The body loses its tubular shape and becomes flattened dorso-ventrally, sometimes to an extreme degree. The body is often distorted into an arc. The tail segment often shortens extremely and becomes relatively wider before the trunk deteriorates. The shortening of the body length can be extreme, specimens of *Flaccisagitta hexaptera* that would normally be 40 mm long can shorten to 20 mm. The head may become greatly shortened and thus appear relatively wider, with the jaws thrown widely apart, and the neck constricted.

Thus the three characters which might possibly distinguish Kassatkina's *Tokiokaispadella* from *Pterosagitta draco*, transverse musculature, short tail segment, and relatively wide body, in my opinion, are artifacts. The genus *Tokiokaispadella* and the family Tokiokaispadellidae based upon it are both invalid.

Status of the Genera *Zahonya* Oye, 1918 and *Aberrospadella* Kassatkina, 1971

In 1918 van Oye described a new species and genus from the Java Sea, *Zahonya cestoda*. No one has found an example of this species since the original description; how-

ever, it has been mentioned in review articles, for example, Tokioka (1965). It seems remarkable that almost no one (Tokioka 1952 excepted) has recognized this species for what it is, a poorly preserved individual showing all the characteristics of the genus *Sagitta* (sensu Ritter-Záhony, 1911) except for the transverse musculature which clearly is an artifact of morbidity before killing with a preservative. Oye's description and drawing are not adequate to distinguish the specimen from the more than 25 epiplanktonic species of sagittids that occur in that region, although Tokioka's supposition (1952) that it might be a small individual of *Sagitta robusta* or *Sagitta ferox* is a reasonable one. Thus, *Zahonya cestoda* is best left as a nomen dubium with the genus *Zahonya* a junior synonym of *Sagitta*.

In 1971 Kassatkina described a new genus and species, *Aberrospadella verruculosa* from Possjet Bay in the Sea of Japan near Vladivostok. The description is based on two contorted specimens 1.4 mm and 3.4 mm long. No seminal vesicles nor ovaries are present. The specimens almost certainly are poorly preserved or diseased individuals of *Parasagitta elegans*. Only the rayless lateral fins, rayless tail fin and the supposed transverse musculature differentiate the species from juvenile *Parasagitta elegans* (see Kotori 1975 for detailed descriptions of early larval stages of *Parasagitta elegans*). The species has two sets of teeth and the number of hooks agrees with *P. elegans* at that size. As Kotori showed, *P. elegans* emerges from the egg with one pair of lateral fins. In juvenile *P. elegans* the collarette is massive, the ventral ganglion is relatively very large, and the tail segment relatively large, all characteristics of *Aberrospadella verruculosa*. Gut diverticulae are present in both species. Although the absence of rays in the fins is something of an enigma, until the species is redescribed based on mature specimens that are clearly in an excellent state of preservation, this species is a nomen dubium and the genus a junior synonym of *Parasagitta*.

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Literature Cited

- Aida, T. 1897. The Chaetognatha of Misaki Harbor.—*Annotationes Zoologicae Japonenses* 1: 13–21, pl. 3.
- Alvariño, A. 1967. The Chaetognatha of the NAGA expedition (1959–1961) in the South China Sea and the Gulf of Thailand. Part 1-Systematics.—*Naga Report* 4, pt. 2:1–197.
- Bieri, R. 1966. The function of the “wings” of *Pterosagitta draco* and the so-called tangoreceptors in other species of Chaetognatha.—*Publications of the Seto Marine Biological Laboratory* 14: 23–26.
- . 1974. First record of the chaetognath genus *Krohnittella* in the Pacific and description of a new species.—*Wasmann Journal of Biology* 32: 297–301.
- Germain, L., & L. Joubin. 1912. Note sur quelques Chétognaths nouveaux des croisières de S. A. S. le Prince de Monaco.—*Bulletin de l'Institut Océanographique* 228:1–15.
- Ghirardelli, E. 1952. Osservazioni biologiche e sistematiche sui Chetognati del Golfo di Napoli.—*Publicazioni della Stazione Zoologica di Napoli*. 23:296–312.
- Goto, T., & M. Yoshida. 1987. Nervous system in Chaetognatha. Pp. 461–481 in M. A. Ali, ed., *Nervous systems in invertebrates*. Plenum Press, New York.
- Grassi, B. 1883. I Chaetognati.—*Fauna und Flora des Golfes von Neapel*, Monograph 5:1–126, 13 pls.
- Kassatkina, A. P. 1971. New neritic species of chaetognaths from Possjet Bay in the Sea of Japan. Pp. 265–294 in *Fauna and flora of the Possjet Bay of the Sea of Japan, explorations of the Fauna of the Seas* 8, Zoological Institute Academy of Sciences of the U.S.S.R., Nauka Press, Leningrad (in Russian).
- . 1980. A new genus *Tokiokaispadella* and its position in the system of Chaetognatha.—*Zoologicheskii Zhurnal* 52:1202–1207 (in Russian).
- Kotori, M. 1975. Morphology of *Sagitta elegans* (Chaetognatha) in early larval stages.—*Journal of the Oceanographic Society of Japan* 31:139–144.
- Michael, E. L. 1919. Report on the Chaetognatha collected by the United States fisheries steamer “Albatross” during the Philippine Expedition, 1907–1910.—*Bulletin* 100, United States National Museum, Smithsonian Institution 1:235–277, pls. 34–38.
- Michel, H. B. 1984. Chaetognatha of the Caribbean Sea and adjacent areas.—*NOAA Technical Report NMFS* 15:1–33.
- Nagasawa, S., & T. Nemoto. 1985. The decay of chaetognaths.—*La Mer, Bulletin de la Société Franco-Japonaise d'Océanographie* 23:56–63.
- Owre, H. B. 1973. A new chaetognath genus and species with remarks on the taxonomy and distribution of others.—*Bulletin of Marine Science* 23:948–963.
- Oye, P. van. 1918. Untersuchungen über die Chaetognathen des Javameeres.—*Contributions a la Fauna des Indes Néerlandaises* 4:1–61.
- Ritter-Záhony, R. von. 1911. Revision der Chaetognathen.—*Deutsche Südpolar Expedition 1901–1903*, 13:1–71.
- Salvini-Plawen, L., V. 1986. Systematic notes on *Spadella* and on the Chaetognatha in general.—*Zeitschrift für zoologische Systematik und Evolutionsforschung* 24:122–128.
- Tokioka, T. 1940. Phylum Chaetognatha.—*Fauna Nipponica* 5(2):1–129.
- . 1952. Chaetognaths of the Indo-Pacific.—*Annotationes Zoologicae Japonenses* 25:307–316.
- . 1965. The taxonomical outline of Chaetognatha.—*Publications of the Seto Marine Biological Laboratory* 12:335–357.

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